National Institute of Standards & Technology

Certificate

Standard Reference Material® 1008

Photographic Film Step Tablet

This Standard Reference Material (SRM) is intended for use in the calibration of optical densitometers and similar equipment used in the photographic, graphic arts, and x-ray fields. SRM 1008 is a photographic silver density film step tablet 25.4 cm (10 in) long by 3.5 cm (1.375 in) wide. The tablet has 23 steps 1.0 cm (0.39 in) wide perpendicular to the long edge of the film with certified transmission densities ranging from less than 0.200 to greater than 4.000. The serial number is located at one end of the step tablet.

Determination of Certified Transmission Density: The transmission density of each step of the tablet was measured using the NIST Diffuse Transmittance Densitometer [1]. The instrument and measurements conform to the conditions specified for American National Standard Diffuse Visual Transmission Density, D_T (90° Opal; S_H: # 10°; V_T) [2,3]. The certified transmission densities listed in Table 2 were measured on a 3 mm diameter circle at the center of each step, and apply only to that area. When measured, the side of the tablet with the serial number was in contact with the diffuser of the densitometer.

Expiration of Certification: The certification of this SRM is deemed to be valid, within the uncertainties specified, for a period of **three years** from the calibration date given in Table 2, provided the SRM is stored and handled in accordance with the Instructions for Use and Storage and Handling sections of this certificate. However, certification will be nullified if the SRM is damaged or contaminated.

Discussion of Uncertainties: Uncertainties were calculated according to the procedures outlined in [4]. Measured (Type A) uncertainties were assumed to be Gaussian-distributed, and were calculated from the standard deviations. Estimated or inferred (Type B) uncertainties were also assumed to be Gaussian-distributed, and were calculated from the measurement equation. The uncertainties were combined by adding their variances in quadrature. Table 1 is a list of all identifiable sources of uncertainty. The measured standard deviations are listed in (a); the inferred standard deviations are listed in (b).

Instructions for Use: Remove the film from its protective sleeve and place the center of a step on the diffuser of the densitometer to be calibrated, with the side of the step tablet with the serial number in contact with the diffuser. Calibrate the densitometer using the transmission density of that step, and repeat this procedure with other steps of the step tablet.

Film step tablets were produced by the Bayer Corporation, AGFA division, Ridgefield Park, NJ.

The technical direction and physical measurements leading to certification were provided by E.A. Early with assistance from C.L. Cromer, D. Dummer, T.R. O'Brian, X. Xiong, and R.D. Saunders of the NIST Optical Technology Division and P.F. Wychorski of the Eastman Kodak Co.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the NIST Standard Reference Materials Program by N.M. Trahey and R.J. Gettings.

Albert C. Parr, Chief
Optical Technical Division

Gaithersburg, MD 20899
Certificate Issue Date: 3 March 2000
See Certificate Revision History on Last Page

Thomas E. Gills, Director
Office of Measurement Services

Storage and Handling: The densities of this photographic film step tablet may change with time. To minimize such changes, the film should be stored in a cool, dry place, where it will not be exposed to light, or other radiant energy, or to chemical fumes, or to dust in the air. Scratches, abrasion marks, or foreign matter on the film can change the density. Fingerprints are a common source of contamination. Fingerprints on the film surfaces can be avoided by handling the step tablet only by the edges and by wearing clean cloth gloves available from photographic film dealers for this purpose. Any attempt to clean a film step tablet, other than to remove dust with a soft camel-hair brush, is not recommended as it is likely to change the densities.

Table 1. Tabulation of Uncertainties

Source of Uncertainty	Uncertainty in Transmission Density
(a) Measured (Type A) Uncertainties	
Source Stability	± 0.001
Signal Noise	± 0.001
Amplifier Gain	<< 0.001
Detector Linearity	± 0.001
Step Uniformity	± 0.001
(b) Inferred (Type B) Uncertainties	
Voltmeter Accuracy	<< 0.001
Diffusion Coefficient	< 0.001
Opal Reflectance	< 0.001
Spectral Product	<< 0.001
Combined Uncertainty (1Φ)	± 0.002
Expanded Uncertainty (3Φ)	± 0.006

REFERENCES

[1] Early, E.A., O'Brian, T.R., Saunders, R.D., and Parr, A.C., "Film Step Tablet Standards of Diffuse Visual Transmission Density - SRM 1001 and SRM 1008," NIST Special Publication 260-135, U.S. Government Printing Office, Washington DC, (1998).

[2] ANSI/ISO 5.2-1991, Photography - Density Measurements - Part 2: Geometric Conditions for Transmission Density, American National Standards Institute, New York, NY.

[3] ANSI/ISO 5.3-1995, Photography - Density Measurements - Part 3: Spectral Conditions, American National Standards Institute, New York, NY.

[4] *Guide to the Expression of Uncertainty in Measurement*, ISBN 92-67-10188-9, 1st Ed. ISO, Geneva, Switzerland, (1993); see also Taylor, B.N. and Kuyatt, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results," NIST Technical Note 1297, U.S. Government Printing Office, Washington DC, (1994); available at http://physics.nist.gov/Pubs/.

Certificate Revision History: 3 March 00 (this revision reflects a change in the expiration period); 27 February 98 (original certificate date).

It is the responsibility of users of this SRM to assure that the certificate in their possession is current. This can be accomplished by contacting the SRM Program at: Telephone (301) 975-6776 (select "Certificates"), Fax (301) 926-4751, e-mail srminfo@nist.gov, or via the Internet http://ts.nist.gov/srm.

Table 2. Transmission Densities of SRM 1008	
Serial No.:	Calibration Date:
Step Number	Transmission Density[a]
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	

[a] Expanded uncertainty ($k = 3$) of the transmission density of each step is ± 0.006 (see Table 1).